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mostly broken. They represented remains of penguin *(Anthropornis Nordenskjöldii, Pachypterix grandis, Eosphoeniscus Gunnari, Delphinornis Larsenii, Ichtyopterix gracilis).* Among other fossils a *Terebratula* and a *Lingula* were noted.

The first account of the geology of the Falkland Islands group, we owe to Charles Darwin, who visited East Falkland in 1854 on the *Beagle.* East Falkland is chiefly low, slightly undulating with flat coasts. It is crossed from east to west by a mountain range of medium height (Wickham Heights, 1,300 to 1,600 feet, Mount Usborne 2,230 feet). West Falkland is in general higher than East Falkland and in many places its coast forms high, steep cliffs. Isolated mountains are here and there, the highest being Mt. Adam, (2,276 feet). Numerous big bays indent the two large islands on all sides. The main formation of the lowlands is a sandstone series (Devonian) of yellowish color, fine grained and often micaceous, with intercalations of clay-slate. The sandstone is highly fossiliferous and shows, where exposed, a peculiar weathering, like that of our Dakota sandstone (Lower Cretaceous) in Colorado. Above the low undulating surface in East Falkland, rise mountain ridges of hard quartzite, striking chiefly E-W. Numerous diabase dikes cut the Devonian sandstone almost vertically or in a steep dip north. The tectonic structure of West Falkland is still almost unknown.—The bottom of the valleys, in many parts of the island, is covered by fragments of quartz, a phenomenon called "stone rivers." The stones show no signs of being waterworn, but are only blunted. The width of the beds varies from a few hundred feet to a mile. Andersson believes that these blocks and fragments are derived from the bands of quartzite in the ridge above them, for they correspond with them in every respect. Andersson is of the opinion that the beds of quartzite, being of different hardness, the softer rocks were worn away in time and the compact quartzites were left as projecting ridges along the crests and flanks of the hill-ranges. With the disintegration of the softer beds, the support of the adjacent beds was taken away from the denuded quartzites, and thus they gave way, the fragments falling upon the gentle slopes of the hillside. When in summer the melting of the snow has reached an advanced stage, the bottoms of the valleys are often free from snow, while big masses still remain in sheltered places on the valley sides. Every warm day new quantities of water trickle from these melting drifts into the rock-waste at their lower edge. As the detritus is composed not only of coarser rock fragments, but also of finer particles filling the interspaces between the coarser material, they are able to absorb considerable quantities of water. When once saturated, they form a semi-fluid substance that moves slowly down hill. To this process, the slow flowing of masses of waste saturated with water from higher to lower ground, Andersson has given the name "solifluction" (compare also his paper on "Solifluction," a component of subaërial denudation, *Journ. of Geology,* vol. 14, 1906, p. 91-112). Andersson brings out the fact that the Falkland Islands were not glaciated during the quaternary, but says: "After all, it seems very probable that the conditions of the Falkland Islands during the ice age were very much like those now prevailing on Bear Island, a sub-glacial climate with a complete melting away in the summer time of the winter's snowcover, a powerful and widely extended solifluction, caused by the snow melting and a scarce and scattered vegetation, that in many places succumbed to the flowing soil."

The flora of Seymour island, West Antarctica is of Tertiary age, but is considerably older than that of the flora at Barrancas de Carmen Sylva or the flora of the Fagus Zone of the Magellan islands. CHARLES L. HENNING.

PHYSICAL GEOGRAPHY

Geographie des Atlantischen Ozeans. Von Prof. Dr. Gerhard Schott. xii and 330 pp. Maps, index. C. Boysen, Hamburg, 1912. Mk. 23. 10½ x 7½.

This is a valuable reference-book, such as was to be expected from Dr. Schott. It was not designed for continuous reading. The features and phenomena of an ocean are so varied that a work on them cannot be a unit to a greater extent than the possibility of putting such of them as can be mapped on a single base map. The topics are the history of exploration, the geology of shores and basin, the physical character and properties of the ocean and its basin, its depths, climates, animals and human pathways. Apart from the printing, the mapping and the frontispiece, which are all works of art, solid contents characterize the book, but it is written clearly and readably.

Is there a man who wants to know what the Gulf Stream has to do with the mild climate of western Europe? He may learn here. To the Gulf Stream is assigned a region, six per cent. of the area of the North Atlantic, between 32° and 42° north and bounded on the east by the 40th parallel of longitude. This lies wholly south of the transatlantic steamer track. In the Newfoundland and West European regions, the stream is called the Gulf Stream Drift, "which we in Europe call the Gulf Stream" (165). "One important and certain conclusion should be set forth as touching the heart of the matter—the Atlantic warm water drift would do Europe no good at all if the masses of warm air over the ocean were not at the same time borne far into western Europe by the southwest winds that prevail in our latitudes. The coast of Norway, if it had prevalent easterly winds, would participate in the severe winters of Sweden and Russia, however full its fiords might be of warm water." For Schott the Labrador current plunges under the Gulf Stream Drift east of the Banks of Newfoundland. The cold water along the American coast (he calls it tragic, but it brings our good fishing grounds 500 miles further south than the European ones) he attributes to the Gulf of St. Lawrence and the upwelling of bottom water under the prevalence of offshore, *i. e.,* westerly winds, bringing it into the same class with the cold water on the west coast of Chile and South Africa.

Wisps of reversed current are described at the southeast border of the drift south of Newfoundland, which may carry a ship back to the southwest fifty miles a day.

The geologic chapter is perhaps the least satisfactory. We meet Trabert's account of the origin of the Atlantic basin by greater cooling of the floor under the cold deeps of the ocean than where the ocean was not; somewhat circular reasoning. No mention of Pickering's much more satisfactory conception of an Atlantic Rift accompanying the birth throes of the moon from the Pacific.

The North Atlantic crossing is said to indicate the overwhelming importance of the United States to the Old World, for over half the total sea traffic of the world travels that route. On it we have seen the Gulf Stream proper is not touched. On this trip, too, one is nowhere a thousand miles from land. For sailing ships this is a less important route. German sailing ships, at any rate, mostly traverse the Atlantic on their way to the Indian and Pacific Oceans.

Madeira, the Azores, the Canaries and the Cape Verde islands are mostly of gneiss and clay-slate, partly covered by volcanics, as if scraps of continents, though rising from great depths.

Areas are given constantly. Thus on the very well-designed map of ocean bottom deposits we find 53 per cent. of globigerina, 25 terrigenous, and 15 red clay.

The mapping of the tints of ocean water is new. It is a pity that they are not reproduced exactly (the frontispiece shows it is possible), and the inevitable errors of the first attempt would be rapidly corrected. It seems strange to find interrogation points only in the Caribbean on the Panama route, also the omission of the strong muddy tint at the great river mouths, the most striking experience on actual voyages. Novel is the area with less than 2½° C. range in its air temperatures along the Amazon from the heart of South America well out toward Africa.

The large map of ocean depths has much new detail, especially toward the Antarctic. The Deeps west of the Atlantic Ridge are open to the south, allowing Antarctic water to creep northward along the ocean floor as far as Newfoundland, warming by the earth's internal heat as it goes. This cannot happen in the eastern Deeps on account of the Walfish Bay Ridge.

An admirable diagram shows at Gibraltar the *sinking* of the warm but salt Mediterranean under water from the west as it emerges into the Atlantic. It is recognizable by its high temperature in the depths off the Irish coast.

Pressure and temperature charts also have changed in the light of new data and noticeably in the polar regions. Instead of polar lows we have here lows at 62° north and south, with a quarter centimeter higher pressures nearer the poles. The stormy Cape Horn passage is thus a trough of low pressure, often passable to westward by crossing to its southern border 200 miles south of the Cape.

Non-German work gets scant recognition excepting Maury, named often and warmly. The work is not exhaustive, but highly suggestive, and has a bibliography and a good index. It has been designed to give information to a somewhat studious type of general reader. Only Germany could produce such a work.

The great German steamship companies have aided in the printing, which is admirable. The maps are well planned to illustrate, projection and all, Lambert's azimuthal being used for most of the physical features. A superb color print reproduces Schnars—Alquist's painting of the "The Blue Atlantic Deeps," for frontispiece. Artist and color printer have succeeded in conveying an almost adequate impression of the unforgetable Atlantic of the Trades. It is better even than Lafcadio Hearn's word picture. MARK JEFFERSON.

Aus der Vorzeit der Erde. Von. Dr. Fritz Frech. I. Vulkane einst und jetzt. 112 pp. II. Gebirgsbau und Erdbeben. 120 pp. III. Die Arbeit des fliesenden Wassers. Eine Einleitung in die physikalische Geologie. IV. Die Arbeit des Ozeans und die chemische Tätigkeit des Wassers im allgemeinen. V. Steinkohle, Wüsten und Klima der Vorzeit. VI. Gletscher einst und jetzt. 2. wesentlich vermehrte Auflage. Maps and ills. in each. In series Aus Natur und Geisteswelt, Vol. 61. B. G. Teubner, Leipzig, 1911. Mk. 1.25 each. 7½ x 5.

The six volumes form a part of the excellent series "Aus Natur und Geisteswelt," published as a means towards the popularization of many branches of pure and applied science. The volumes by Frech form a treatise on physiography in concise form and up to date. They are a popular exposition of well-known facts, very useful for the readers in view, but, of course, making no original contribution to science. In Vol. I, Frech describes the phenomena of volcanoes, taking Vesuvius, Etna, Mont Pelé and the volcanoes of Hawaii and Samoa as typical examples. "The composition of the Atlantic eruptives is entirely different from those of the Pacific," he says. "From the volcanic vents in the Pacific belt, torn up through lateral torsion, the lighter eruptives with a predominating content of lime and magnesia rise, while from the Atlantic faults of depression, the heavier eruptives with a predominating content of soda, clay and iron are emerging" (I., p. 57). In the chapter on the after effects of vulcanism, Frech describes the geysers and cognate phenomena. He explains the volcanic forces as due to the wasting of gases from the earth's interior. But as the escaping of gases takes place through the fissures and faults of the earth, such catastrophes will cause earthquakes upon a larger scale. Thus the earthquakes are not of volcanic but of tectonic origin and come to pass through a sequence of processes, connected with mountain-making, *viz.*, folding, sinking and torsioning of the earth's crust. (p. 108).

In Vol. II, Frech gives a concise explanation of the elementary terms in geology, such as folds, faults, dislocation, etc., and explains the various phases of mountain-making. Vol. III deals with the work of flowing water and the formation of valleys. Vol. IV with the formation of soils and with climate and its relation to man. The various forms of hills and mountains, plains and peneplains and their relation to the work of wind and water erosion are described. The sculpturing of the land by sea waves, the difference in hardness and resistance of rocks and an outline of the principal facts of paleogeography form an important part of the volume.

The origin and distribution of coal and oil are described in Vol. V, together with a chapter on climatic conditions in past ages of the earth's history. Vol. VI deals with the work of ice and snow, with glaciation and the glacial periods in the various parts of the globe.